

*Original Article***Discharge index and prediction for stroke patients in the post-acute stage: Evaluation of the usefulness of Nichijo-seikatsu-kino-hyokahyo**Nobuhiko Iwai, PT, PhD,<sup>1</sup> Yoichiro Aoyagi, MD, PhD<sup>2</sup><sup>1</sup>Faculty of Rehabilitation, Kobegakuin University, Kobe, Hyogo, Japan<sup>2</sup>Department of Rehabilitation Medicine I, School of Medicine, Fujita Health University, Toyoake, Aichi, Japan**ABSTRACT**

Iwai N, Aoyagi Y. Discharge index and prediction for stroke patients in the post-acute stage: Evaluation of the usefulness of Nichijo-seikatsu-kino-hyokahyo. *Jpn J Compr Rehabil Sci* 2012; 3: 37–41.

**Introduction:** The objective of this study was to evaluate whether or not the Nichijo-seikatsu-kino-hyokahyo could be used as an index for predicting ADL independence level or discharge destination.

**Method:** The subjects were 482 patients extracted from the Japanese Association of Rehabilitation Medicine Patient Database (stroke). Multiple regression analysis was performed with a dependent variable, FIM at discharge, and with independent variables including age, pre-onset mRS, post-onset hospital day, number of days hospitalized, motor FIM and cognitive FIM at admission. The Nichijo-seikatsu-kino-hyokahyo at admission was added to the independent variables, and predictability was compared. Logistic regression analysis was performed with a dependent variable, discharge destination, and with independent variables including age, pre-onset mRS, post-onset hospital day, number of days hospitalized, nursing availability, motor FIM and cognitive FIM at admission. The Nichijo-seikatsu-kino-hyokahyo at admission was added to the independent variables, and the predictive value was compared.

**Results:** Determination coefficient  $R^2$  increased by approximately 0.04 but the predictive value remained the same after adding the Nichijo-seikatsu-kino-hyokahyo at admission.

**Conclusion:** The results of analyses on the database

used in this study suggest that the Nichijo-seikatsu-kino-hyokahyo does not yield better predictability for the ADL at discharge or discharge destination.

**Key words:** stroke patients in the post acute stage, Nichijo-seikatsu-kino-hyokahyo, discharge index, FIM

**Introduction**

According to the partial revision of the Act on the Social Insurance Medical Fee Payments Foundation in 2008, the ward fee for severe disability cases in a convalescence ward was newly added to the hospitalization fee for the convalescent rehabilitation ward. Nichijo-seikatsu-kino-hyokahyo is used to evaluate severe disability cases. In actual settings, this assessment method is often verified as ADL assessment since “nichijo-seikatsu (daily-living activities)” sounds similar to “activities of daily living (ADL)”. For instance, Toshima et al. [1] compared the Nichijo-seikatsu-kino-hyokahyo scores and the total scores of functional independence measure (FIM) and reported that the total FIM scores could differ by more than 40 points among cases with the same Nichijo-seikatsu-kino-hyokahyo scores, although the two measures were highly correlated with each other. Moreover, Kobayashi [2] indicated that criteria for evaluating the Nichijo-seikatsu-kino-hyokahyo scores do not include crucial items necessary for conducting ADL such as excretion or bathing, while they include “instruction for bed rest”, which is not appropriate for a convalescent rehabilitation ward, thus highlighting the inadequacy of this measurement in convalescent rehabilitation wards. Thus, it is not clearly indicated what the Nichijo-seikatsu-kino-hyokahyo should be used for in actual convalescent rehabilitation wards. It is relatively easy to see the results of rehabilitation in the convalescent phase; therefore, active and positive rehabilitation, including improvement in ADL, are necessary along with management of illness and risks. It is important to find an index which precisely evaluates the effects of interventions in stroke patients' rehabilitation in the post-acute stage.

In this study, we investigated to what extent the

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Nichijo-seikatsu-kino-hyokahyo could indicate the ADL independence level and the possibility of returning home in stroke patients who had been admitted to a convalescent rehabilitation ward.

### Method

The subjects included 708 patients who had been admitted to and discharged from a convalescent rehabilitation ward since April 2008, extracted from the Japanese Association of Rehabilitation Medicine Patient Database for stroke (December 2010). The exclusion criteria included patients with diagnoses other than cerebral infarction, cerebral hemorrhage, and subarachnoid hemorrhage, patients with unknown post-onset hospital day, patients with pre-onset modified Ranking Scale (mRS) other than 1–5, patients hospitalized for more than 181 days, patients with unknown discharge destination or death, patients with nursing availability other than 1–5 (1: hardly available, 2: between 1 and 3, 3: equivalent to one full-time nurse, 4: between 3 and 5, 5: equivalent to two full-time nurses), patients for whom FIM data at admission and discharge were missing, and patients for whom the data of Nichijo-seikatsu-kino-hyokahyo at admission were missing.

FIM [3,4] consists of 18 evaluation items, of which 13 are associated with motor and 5 are associated with cognition. Each item is evaluated on a scale of 1 to 7 according to the amount of assistance they receive; the higher the score, the higher the ADL independence level. The Nichijo-seikatsu-kino-hyokahyo [5] consists of 13 evaluation items. The score for each item is 0, 1 or 2; the lower the score, the higher the level of independence in daily living. The evaluation items consist of conditions associated with paralysis, which is a functional disorder, and those with ability disorders such as basic movements, ADL, and cognitive ability (Table 1).

First of all, Spearman's rank correlation coefficient was obtained for the Nichijo-seikatsu-kino-hyokahyo at admission and the following 6 items: age, pre-onset mRS, post-onset hospital day, number of days hospitalized, motor FIM and cognitive FIM at admission.

Secondly, single regression analysis was performed on the following 7 items which appeared to affect ADL at discharge: age, pre-onset mRS, post-onset hospital day, number of days hospitalized, motor FIM and cognitive FIM at admission, and Nichijo-seikatsu-kino-hyokahyo at admission, as well as on FIM at discharge. Then, stepwise multiple regression analysis

**Table 1.** Nichijo-seikatsu-kino-hyokahyo

Patient's condition	Score		
	0 point	1 point	2 points
Instruction of bed rest	None	Present	
Either right hand or left hand can be raised up to the chest	Possible	Impossible	
Rolling over	Possible	Possible if there is something to hold on to	Impossible
Sitting up	Possible	Impossible	
Maintaining the sitting position	Possible	Possible if there is any supporting tool	Impossible
Transfer from bed to wheelchair	Possible	Close observation / partial assistance is needed.	Impossible
Transfer method	Moving without assistance	Moving with assistance (including transportation)	
Oral hygiene care	Possible	Impossible	
Having meals	Without assistance	Partial assistance	Total assistance
Dressing	Without assistance	Partial assistance	Total assistance
Communication with others	Possible	Sometimes possible, sometimes not	Impossible
Understanding indications of clinical treatment or care	Yes	No	
Dangerous behavior	None	Present	
*Scores: 0–19			
*The lower the score, the higher the independence level of living.		Total score:	points

was performed with items found to be statistically significant, as independent variables (except for the Nichijo-seikatsu-kino-hyokahyo at admission), and with FIM at discharge as a dependent variable. The Nichijo-seikatsu-kino-hyokahyo at admission was then added to the above-listed independent variables, and predictability was compared.

Furthermore, Mann-Whitney's U test was performed for differences in the following 8 items which appeared to affect the discharge destination: age, pre-onset mRS, post-onset hospital day, number of days hospitalized, nursing availability, motor FIM and cognitive FIM at admission, Nichijo-seikatsu-kino-hyokahyo at admission, and on whether or not the patient could return home. Multiple logistic regression analyses were performed with items which had been significantly different, as independent variables (except for the Nichijo-seikatsu-kino-hyokahyo at admission), and with whether or not the patient could return home as a dependent variable. The Nichijo-seikatsu-kino-hyokahyo at admission was then added to the above-listed independent variables, and differential predictive values were compared.

SPSS ver. 18.0 J (for Windows) was used for the statistical analyses, and the level of significance was set as below 5%.

## Results

482 patients were extracted, including 301 males and 181 females of age  $67.8 \pm 13.1$  years ( $\pm$  standard deviation). The post-onset hospital day was  $33.3 \pm 19.4$  days, the number of days hospitalized was  $93.6 \pm 45.0$ , motor FIM at admission was  $48.0 \pm 23.0$ , cognitive FIM at admission was  $21.7 \pm 9.1$ , and FIM at discharge was  $92.7 \pm 29.9$ . The Nichijo-seikatsu-kino-hyokahyo at admission was  $6.8 \pm 4.8$ . The discharge destination was home for 375 patients (77.8%) and a place other than home for 107 patients (22.2%) (Table 2).

**Table 2 .** Characteristics of patients

	482 (male 301, female 181)
Number of subjects	
Age (years)	67.8±13.1
Post-onset hospital day (days)	33.3±19.4
Days hospitalized in ward (days)	93.6±45.0
FIM at admission (score)	69.7±29.8
Motor FIM at admission (score)	48.0±23.0
Cognitive FIM at admission (score)	21.7±9.1
FIM at discharge (score)	92.7±29.9
Nichijo-seikatsu-kino-hyokahyo at admission (score)	6.8±4.8
Discharge destination	
Home (number)	375(77.8%)
A place other than home (number)	107(22.2%)

With regard to Spearman's rank correlation coefficient with the Nichijo-seikatsu-kino-hyokahyo, statistically significant relationships were observed in all items (Table 3). Of these, highly negative correlations were observed with motor FIM at admission and cognitive FIM at admission. With regard to single regression analyses with FIM at discharge, statistically significant relationships were observed in all items (Table 4).

According to the results of stepwise multiple regression analyses using FIM at discharge as a dependent variable, the formula for predicting FIM at discharge was [ $63.522 - 0.348 \times \text{age} - 0.088 \times \text{post-onset hospital day} + 0.612 \times \text{motor FIM at admission} + 1.218 \times \text{cognitive FIM at admission}$ ]. The determination coefficient  $R^2$ , which indicates predictability of FIM at discharge, was 0.675 ( $p < 0.01$ ). When the Nichijo-seikatsu-kino-hyokahyo at admission was added, the formula for prediction of FIM at discharge was [ $96.634 - 0.267 \times \text{age} + 0.232 \times \text{motor FIM at admission} + 0.97 \times \text{cognitive FIM at admission} - 2.627 \times \text{Nichijo-seikatsu-kino-hyokahyo at admission}$ ], and the determination coefficient  $R^2$

**Table 3.** Spearman's rank correlation coefficient with the Nichijo-seikatsu-kino-hyokahyo

	correlation coefficient	p-value
Age	0.257	p<0.01
Pre-onset mRS	0.252	p<0.01
post-onset hospital day	0.113	p<0.05
number of days hospitalized	0.408	p<0.01
motor FIM at admission	-0.840	p<0.01
cognitive FIM at admission	-0.657	p<0.01

**Table 4.** Single regression analyses with FIM at discharge

Independent variables	correlation coefficient	determination coefficient	p-value
Age	0.323	0.104	p<0.01
Pre-onset mRS	0.172	0.030	p<0.01
post-onset hospital day	0.102	0.010	p<0.05
number of days hospitalized	0.260	0.067	p<0.01
motor FIM at admission	0.752	0.566	p<0.01
cognitive FIM at admission	0.721	0.520	p<0.01
Nichijo-seikatsu-kino-hyokahyo	0.797	0.636	p<0.01

\*Dependent variable is FIM at discharge

**Table 5.** Results of stepwise multiple regression analyses

Independent variables	Nichijo-seikatsu-kino-hyokahyo not included			Nichijo-seikatsu-kino-hyokahyo included		
	Non-standardized coefficient	Standardized coefficient	p-value	Non-standardized coefficient	Standardized coefficient	p-value
Constant	63.522			96.634		
Age	-0.348	-0.153	p<0.01	-0.267	-0.117	p<0.01
Pre-onset mRS		Excluded			Excluded	
post-onset hospital day	-0.088	-0.057	p<0.05		Excluded	
number of days hospitalized		Excluded			Excluded	
motor FIM at admission	0.612	0.470	p<0.01	0.232	0.179	p<0.01
cognitive FIM at admission	1.218	0.369	p<0.01	0.97	0.294	p<0.01
Nichijo-seikatsu-kino-hyokahyo				-2.627	-0.421	p<0.01
Determination coefficient R <sup>2</sup>		0.675 (p<0.01)			0.719 (p<0.01)	

\*Dependent variable is FIM at discharge.

**Table 6.** Variables which significantly affected the prediction of discharge destination (multiple logistic regression analyses)

Items	Nichijo-seikatsu-kino-hyokahyo not included			Nichijo-seikatsu-kino-hyokahyo included		
	Odds ratio	95% confidence interval	p-value	Odds ratio	95% confidence interval	p-value
Age	1.044	1.018~1.071	p<0.01	1.044	1.018~1.071	p<0.01
Nursing availability	0.303	0.206~0.446	p<0.01	0.303	0.206~0.446	p<0.01
motor FIM at admission	0.943	0.925~0.962	p<0.01	0.943	0.925~0.962	p<0.01
cognitive FIM at admission	0.915	0.874~0.957	p<0.01	0.915	0.874~0.957	p<0.01
Differential predictive value (%)		87.8			87.8	
Variables used	Age, pre-onset mRS, post-onset hospital day, nursing availability, motor FIM at admission, cognitive FIM at admission			Age, pre-onset mRS, post-onset hospital day, nursing availability, motor FIM at admission, cognitive FIM at admission, Nichijo-seikatsu-kino-hyokahyo at admission		

\*Dependent variable is whether or not the discharge destination is home.

increased to 0.719 ( $p < 0.01$ ) (Table 5). According to the results of multiple logistic regression analyses for the discharge destination, the differential predictive value was 87.8%. The variables which significantly affected the results were age (odds ratio 1.044, 95% confidence interval 1.018 – 1.071,  $p < 0.01$ ), nursing availability (0.303, 0.206 – 0.446,  $p < 0.01$ ), motor FIM at admission (0.942, 0.925 – 0.962,  $p < 0.01$ ), and cognitive FIM at admission (0.915, 0.874 – 0.957,  $p < 0.01$ ) (Table 6). The differential predictive value was still 87.8% even after adding the Nichijo-seikatsu-kino-hyokahyo, and the variables which significantly affected the results were also the same.

## Discussion

The prediction of discharge destination or ADL at discharge using the Nichijo-seikatsu-kino-hyokahyo has hardly ever been verified in a multi-center large-scale study. According to the results of this study, determination coefficient R<sup>2</sup> increased by approximately 0.04 by adding the Nichijo-seikatsu-kino-hyokahyo to the traditional assessment values at admission in stroke patients staying at a convalescent rehabilitation ward. It appeared that the addition of Nichijo-seikatsu-kino-hyokahyo slightly increased the determination coefficient because there were strong

correlations between the Nichijo-seikatsu-kino-hyokahyo at admission and motor FIM and cognitive FIM at admission. However, multiple regression analyses showed that  $R^2$  tended to increase as the number of independent variables increased [6]; it is not likely that the Nichijo-seikatsu-kino-hyokahyo at admission had its own factors which affected the FIM at discharge. In addition, the differential predictive value did not change even after the Nichijo-seikatsu-kino-hyokahyo was added to the prediction of discharge destination due to strong correlations between the Nichijo-seikatsu-kino-hyokahyo and motor FIM and cognitive FIM at admission. Furthermore, it was speculated that the Nichijo-seikatsu-kino-hyokahyo was not extracted as a factor which would significantly affect the discharge destination as its effect was smaller than that of motor FIM and cognitive FIM at admission.

Thus, it appeared that the Nichijo-seikatsu-kino-hyokahyo is not an optimal index for discharge because there are only two or three levels for the assessment, making it difficult to show precisely the improvement yielded by rehabilitation. Moreover, most of the evaluation items in this assessment belong to ability disorders; therefore, the addition of other items such as basic movement, ADL or cognition leads to a lack of homogeneity and balance. In addition to these items, it also includes paralysis, which is the only item of the functional disorder level [7], suggesting that changes in ADL, which are carefully observed in the convalescent rehabilitation ward, may not be precisely reflected. According to the results of database analyses (stroke data) used in this study, the Nichijo-seikatsu-kino-hyokahyo does not appear to be a suitable index for predicting ADL independence level or discharge destination of home. It has also been indicated that collected data may vary widely in a multi-center study [8], suggesting that further investigations and careful data interpretation will be necessary in the future.

The Nichijo-seikatsu-kino-hyokahyo was originally prepared by making minor adjustments to Item B (patients' conditions, etc.) of an assessment associated with severity of illness and the degree of nursing need [9]. Therefore, this method appears to be appropriate only for assessing the severity of illness or the amount of nursing/care at convalescent rehabilitation wards where the main purpose of staying is to improve ADL.

### Conclusion

According to the database analyses performed in this study, the Nichijo-seikatsu-kino-hyokahyo index is unlikely to result in better prediction of FIM at

discharge or predictability of discharge destination in stroke patients admitted to the convalescent rehabilitation ward. However, further studies are needed from various aspects to evaluate the usefulness of this assessment method since it has been used in the Medical Fee Payments Calculation Criteria at convalescent rehabilitation wards.

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